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half way down the cañon wall, the bed of which has been cast in andesitic lava, and the volume of whose water discharge is recorded in pumice stone.

These events probably belong, however, to miocene and pliocene times, and the topography of this region in those periods—the course of the rivers and the configuration of the country must for the most part remain unknown.

Topographic changes of quarternary times are, however, much more easily traced. The mass of glacial ice necessary to carry the great boulder described above to its present resting place would change the whole drainage of the park. The waters of the Upper Yellowstone and of the numerous tributaries of the lake would be forced across the low continental divide to the south and become tributary to Snake river and the Pacific, or otherwise to some of the western branches of the Missouri.

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A COLLECTOR'S NOTES ON THE BREEDING OF A FEW WESTERN BIRDS.

BY E. HOLTERHOFF, JR.

THE bird fauna of the country lying east of the Mississippi river, has been for years exhaustively studied and written about by the resident naturalists scattered over its entire surface; but the great expanse of territory lying west of that river has been comparatively little studied, and offers for the naturalist the greatest attractions. Especially is this the case in those territories, where, until the past few years, the military posts of the Government, and a few trading posts, constituted the sole settlements of the white man. Now, however, the advent of a resolute mining population has opened out much new country which will steadily continue to develop, and as population pours in, there will come some eager and able to investigate and make known its treasures of natural history.

It was with great satisfaction that I found myself in Southern California, in the spring of the present year, and at the commencement of the breeding season of its birds. And although I was called away by the first of April, and unable to study any but the earliest in breeding, yet a month later I was able to continue my studies and collections in the vicinity of Tucson, A. T., and in a

still better field. And although not in the field as much as I could have desired, the results of my collections amply repaid me, and intimated how much more could be developed by continuous and extended search.

The hawks are very numerous in the vicinity of Los Angeles, Cal., and are represented by many species, the most common of which is the western red-tail hawk (*Buteo montanus*). This large and beautiful hawk is very little different from its eastern congener, the *B. borealis*, being slightly larger and with some differences in markings. Its nests and eggs are scarcely distinguishable from those of the eastern species: the nest in situation, however, is more accessible and less concealed, owing to the scant and low growth of timber. This consists of sycamore, cottonwood, and oak trees of several varieties, and does not offer the protection of our eastern and northern forests. Another western variety of an eastern species, the western red-shouldered hawk (*Buteo elegans*), is quite common, and several nests were observed, one in a willow tree not twenty feet from the ground, was quite thickly lined with pappus from the willow, which was likewise scattered about the nest generally. The eggs, three in number, were similar to those of the Eastern species, being of a dusky white ground color, marked with large red blotches. The brown hawk (*Buteo insignatus*), is not rare, although not seen so often as either of the former, owing to its frequenting quiet secluded places. A pair of these birds took possession of an old last year's nest which I had examined once and found old and deserted, and, after slightly repairing the inside, and lining it with green mistletoe, proceeded to lay their eggs. Riding by the nest shortly after, I observed the bird sitting on it and secured both bird and eggs; the latter, three in number, of a faint greenish white tinge, and marked with a few large, dark red blotches around the larger end. Out of the many other varieties of hawks, some of which I could not determine, I did not succeed in finding any breeding, excepting the little sparrow hawk (*Tinnunculus sparverius*), which is everywhere abundant, and whose eggs are familiar all over the country.

Among the owls, the great horned owl (*Bubo virginianus* var. *pacificus*), is quite common and I found several nests rather late, and all with young birds in. The barn owl (*Strix pratincola*), together with the long-eared owl (*Otus wilsonianus*), I found

in great numbers on the northern slopes of the foot hills, where in the dark shades of the thick growth of live oak, they found an abode well suited to them. The long-eared owl nested in great numbers in the oak trees, building a clumsy nest of coarse sticks and twigs lined with grasses, and laid from four to six dirty white eggs. The barn owl, while it remained in these thickets during the day, resorted more commonly to the bottom lands to breed, where in the hollow trunks and branches of the sycamores, it found its favorite resting places. Its eggs, also of a dirty white color, are not much larger than those of the long-eared owl, although the bird is considerably larger. The little burrowing owl (*Athene cunicularia*) is very abundant, inhabiting the deserted holes of the California ground squirrel, with which, as with the prairie dog, it seems to live in harmony. They had not yet commenced breeding when I left the vicinity of Los Angeles, or at least I found no eggs in the several burrows which I dug up. The mottled owl (*Scops asio*) breeds here, as a friend of mine found a set of four eggs, and captured the bird on the nest, but the bird keeps close in the hollow trees and can scarcely be scared from its retreat or nest, and thus escapes observation. Later, in Arizona, I observed several times a very small owl which I was unable to identify or procure a specimen of.

One of the earliest birds to nest in the vicinity of Los Angeles, was the white-rumped Shrike (*Collyrio excubitoroides*). It is quite abundant, and owing to the brightness of its plumage, and the absence of many of the migratory birds which had not yet returned from the South, is very noticeable. I found quite a number of nests of this bird, all placed in low trees or bushes, and compactly built of small sticks and grasses, and lined thickly with the pappus from the *Baccharis*, a species of *Compositæ*. The eggs are very similar to those of other shrikes and are well known. Another early breeder is the California jay (*Cyanocitta californica*). This bird is also numerous and with all the traits of the blue jay, is not near as handsome a bird. It builds its nest in a thick tree or bush, and while it resembles that of the blue jay, it never has mud in its construction. The eggs, varying in number from four to five, are very handsome, being of a rich emerald green color, and marked with numerous dark brown spots, thicker around the larger end. The California sickle-bill (*Harporhynchus redivivus*), a thrush whose liquid melody of song may favorably com-

pare with that of the mocking-bird, is a resident by no means rare in Southern California. It is, however, very shy and plunges abruptly into the nearest bushes on being approached or disturbed. It nests, after the fashion of all its family, in low trees or bushes, near the ground, and preferably in a thicket or secluded place. The only nest with eggs that I found was at Cotton, Cal., a short time after leaving Los Angeles. It was situated in a low elder tree, and was composed of coarse twigs and grasses, and lined with fine rootlets; resembling the nests of others of the *Harporhynchus* family, it was not so large as any of them. The three eggs, which constituted the complement, were well incubated. They were of a light pea-green color, marked quite thickly at the larger end with dark brown spots of a considerable size, and were rather elongated. Some weeks later, on the Colorado desert, at a station called Flowing Wells, I found a nest and two eggs of the LeConte's thrush (*Harporhynchus lecontei*), a variety of the *H. redivivus*, according to Dr. Coues. It is a smaller and lighter colored bird than *H. redivivus*, and its nest and eggs are considerably different. The nest was placed in a palo verde tree and was a very bulky affair, measuring externally nine inches in depth and six in width; the hollow of the nest was fully three inches in depth. It was so awkwardly situated that much of the base of the nest had evidently been filled in to firmly support the structure. The two eggs were somewhat smaller than those of *H. redivivus*, lighter in color and marked all over with finer reddish spots, thicker at the larger end.

Campylorhynchus brunneicapillus is the long name given by scientists to a very odd little creeper wren which is peculiar to the south-western States and Territories. The cactus wren, so called from its habit of nesting in the cactus whenever available, is stationary in its habitat, keeping together in little flocks during the winter and separating early in the spring into pairs. They are very early breeders, numerous dates in February being given for the finding of nests and eggs. It was the tenth of April, however, before I succeeded in finding a nest with eggs, but shortly after I found nests containing large young ones. Their nests are worthy of notice, for they have no resemblance to the nests of any other birds in our fauna. They are shaped somewhat like a retort, and are laid on the branches or between the forks of a cactus. The body of the nest is rounded, often as large as a man's head,

and composed entirely of grasses well interwoven and lined thickly with feathers. The entrance is by a long funnel-shaped passage on one side and at the top of the nest, and varying in length from six to ten inches. The lining of feathers is very thick and is comprised of feathers of many birds. Dr. Heerman, an old time ornithologist, has said that he would often tear open the nest of a cactus wren to ascertain what birds were in the vicinity. The number of eggs in a full complement is almost invariably five; occasional nests with three or four well-incubated eggs constituting the only exceptions. The eggs are of a pale salmon color, marked so thickly and evenly with darker salmon color as to give a very rich cast to the whole egg. While the bird commonly seeks the cactus to build its nest in, sometimes when this is scarce, it will build in a mesquite or other tree, and in this case almost always at a considerable height—ten to twenty feet. I am told that this bird raises a brood as late as August, and if it does, as I have no reason to doubt, it then breeds continuously during a period of six months. In that time one pair could raise five or six broods, but it is not likely that they make a new nest as soon as one brood is fully fledged.

A very common bird from the mountains to the coast, in California, is the brown towhee (*Pipilo fuscus*). These plainly colored finches, although pre-eminently ground birds, nest in low bushes or scrub trees, contrary to the habits of the family. A nest, found shortly before leaving Los Angeles, was placed between the forks of a prickly pear cactus, and contained four eggs of a light blue color, marked with lines and dots around the larger end, resembling the eggs of some blackbirds. The nest was composed of grasses and fibers from the bark of the cactus, and lined with horsehair. There are two other species of the same genus and somewhat resembling this bird, which I afterwards found breeding in Arizona, the Abert's finch (*Pipilo aberti*) and the canon finch (*Pipilo mesoleucus*). They also are tree or bush builders, and there is a similarity between the nests and eggs of all three. The Abert's finch built a somewhat larger and not as neat a nest as the others, composed entirely of grasses and lined with a few horsehairs. The eggs, larger than either of the others, were of a light blue color, marked with numerous black lines and spots in a ring around the larger end, and also with a number of bright red spots. The canon finch, nesting in the same situations,

built a smaller and neater nest, composed of fibers from the dead cactus and a few fine grasses, and lined with the soft fibers. The eggs, three in number, like those of the Abert's finch, were of a light blue color and marked more universally and thickly with dark spots, thicker at the larger end.

The little house finch (*Carpodacus frontalis*) is everywhere abundant throughout Southern California and Arizona. I found its nests in all sorts of places and at all times. The eggs are very similar to those of our Eastern purple finch. The Western lark (*Sturnella neglecta*), although everywhere abundant, escaped my notice in nesting until just as I was leaving California, when I found a nest and six nearly incubated eggs. There is no perceptible difference between the eggs and those of *S. magna*. The black flycatcher (*Sayornis nigricans*), a bird much resembling our pewee in its habits and mode of nesting, is not rare in California. They seem to be in pairs all the year round, and may raise a very early brood. The only nest I found was at Cabazon, Cal., and was plastered to the side of a house after the fashion of the barn swallow. It was composed of mud and lined with grasses, and contained four pure white eggs of delicate texture. At this same place, in some willow trees growing alongside a little stream, I found several nests of the Arkansas finch (*Chrysomitris psaltria*), all with young birds except one, which contained four bluish-white eggs. The nest and eggs are very similar to our *C. tristis*.

After leaving Los Angeles, I proceeded by stages along the route of the Southern Pacific railroad, and with a short time to spare at different stations, found some nice things before reaching Tucson, A. T. At Colton, Cal., I first found the nest of that diminutive little bird, the least bush titmouse (*Psaltiriparus minimus*). An inhabitant of the Pacific coast country, it does not penetrate east of the mountains, but west of them is abundant the whole length of the coast. A small and plainly colored little bird, its habits confine it to the bushes, and it is not easily seen or distinguished. The first nest I found was suspended from the branches of a greasewood bush, and I at once recognized it, but thought it deserted, it looked so old. Tearing it open, however, I found it contained six small pure white eggs, partly incubated. Regretting my haste in spoiling the nest, I pursued my hunt, and was shortly rewarded by finding another nest suspended from the branches of an elder bush. I frightened the bird from the nest

and succeeded in shooting it for positive identification. The beautiful little structure was shaped like a purse, and the contracted rim was worn around two or three little shoots of the limb, the nest hanging free. It was about six inches in length and was composed of mosses, shreds of vegetable fiber, inner strips of bark and lichens, all woven into a thick, strong felt, and the bottom on which the eggs lay was softened with willow down and feathers. The entrance to this remarkable structure was a small hole, not an inch in diameter, placed at the very top, and concealed by some leaves of the bush skillfully woven over it. The eggs, six in number in each nest, were unlike those of the rest of the family in being pure spotless white, without gloss. They were very delicate and not over a-half an inch in length. Another minute little bird, but of another family, is the black-headed gnat-catcher (*Polioptila melanura*). I first saw this gnat-catcher, to recognize it, at Indio, on the Colorado desert. There were a great many gnat-catchers around Los Angeles, but I did not notice them closely or shoot any, taking them all to be the blue-gray species. At Indio, however, in the clumps of mesquite trees, which first appear here, I saw numbers of these little birds and then recognized them as the black-headed species. There is a species of mistletoe which grows thickly in nearly every mesquite tree, and in it, after close search and watching, a pair of the birds. I found their nest woven to the branches in the heart of the parasitic plant. It was a delicate little structure, composed of various vegetable fibers, a down from some plant and fine strips of bark, compactly matted together and lined with the same downy material. The nests were not as handsome as those of the blue-gray gnat-catcher, but were very neat and elegant. The first nest found contained three young birds and one egg, but further search discovered another nest with four eggs in, slightly incubated. The eggs, about the size of those of the blue-gray species, were of a lighter color and more thickly marked with black and reddish spots. Later, in Arizona, I noticed the remaining species of gnat-catcher peculiar to our fauna, the Arizona or lead-colored gnat-catcher (*Polioptila plumbea*). It was too late at the time to find either eggs or young ones in the nest, as all that I saw were in little families—the parents and young brood.

At Indio I likewise first noticed a bird which became more common and familiar in Arizona, viz., the black-crested fly-catcher

(*Phænopepla nitens*). All along the line of railroad through the Colorado desert, where the mesquite grows at all—and this is at intervals only—I saw little flocks of these birds sitting on the tops of the trees, and ever and anon darting through the air in pursuit of insects. During my hunt for the gnat-catcher's nest I started one of these birds from a thick clump of mistletoe, and on close examination discovered its nest in it. Climbing the thorny mesquite with many a scratch, I at length succeeded in getting a footing where I could look in the mistletoe and examine the nest. It contained two eggs, and was of a very peculiar construction for a nest built in a tree, and looked more like the nests of such birds as build in a hole in a tree, as the ash-throated fly-catcher. It was small and composed of small twigs, grasses, vegetable fibers and down, loosely matted together, and with a small cavity pressed out in it. It was in the heart of the mistletoe and was not fastened to its branches, but laid on them and kept secure by the thick growth of the plant. The two eggs, considerably advanced in incubation, were very peculiar—of a slate-colored body ground, they were thickly marked all over with black spots, forming a dark ring around the center of the egg, which gradually shaded off at the larger end. They somewhat resemble the eggs of the cedar bird. The bird itself I did not recognize until I had shot and examined it. A peculiarity in its plumage, noticeable in flight, is the white color of the inner webs of the primaries; this, looking from beneath the bird while on the wing, gives a transparent look to half of the wings. Two eggs seem to be a small number for a full set, but they were nearly incubated and the cavity of the nest did not look as if it could contain more, so it may be the full number. Although I saw numbers of these birds at Tucson, yet it was later and I found no more nests.

The Arkansas fly-catcher (*Tyrannus verticalis*)—the Western bee-bird—is everywhere common. At Tucson I first found the nest and eggs, which cannot be distinguished from those of our *T. carolinensis*. The long-tailed chat (*Icteria longicauda*) is fully as common as our yellow-breasted chat, and is, in fact, too much like it to form a distinct species. Its nests, and eggs too, are identical with the yellow-breasted species. The little yellow warbler (*D. æstiva*) is abundant; and I was surprised to observe several pairs of redbirds (*Cardinalis virginianus*) around Tucson,

and to find the nest of one pair. This seems to me an extreme western limit for the bird. The little Bell's vireo (*Vireo belli*) enlivened the solitude of the chaparral with its warble, short and sweet. I found numbers of its little pensile nests, like those of the warbling vireo (*Vireo gilvus*), and all within a few feet of the ground. The set of eggs, three in number, are very like those of *V. gilvus*, but smaller and more pointed. Among the troupials, the hooded troupial (*Icterus cucullatus*) and the Bullock's troupial (*Icterus bullockii*) are the most common around Tucson, and the only ones whose nests I found. The hooded troupial builds a pensile nest composed entirely of grasses, and lined at the bottom with a few bunches of down. It is not unlike the nest of our orchard troupial. The eggs, three in number in every nest I found, are unlike those of the other troupials I have seen, but are marked with light and dark brown spots, chiefly around the larger end, and are of a bluish-white body color. The nests were all very thin, but firmly woven. A nest of the Bullock's troupial which I found a few miles out of Tucson, is a very beautiful and unique structure. It is composed entirely of different colored twine and yarn, horsehair and bits of paper, and so well and thickly is the horsehair woven in, that the nest is very stiff and substantial, and scarcely compressible. A bit of newspaper woven in the bottom of the nest, bears the words, "special attention," and is very appropriate. This nest contained five eggs, evidently a large set. They were of the size and shape of those of the Baltimore bird, but of a smoke color and thickly marked all over with lines and blotches, the lines forming a thick net-work around the larger end. The Carolina dove (*Zenaidura carolinensis*) is very numerous; and the white-winged dove (*Melopelia leucoptera*) was not uncommon, although not so abundant as back in the mountains where it breeds. I had the good fortune to find a nest of the little ground dove (*Chamæpelis passerina*). I had seen several of these beautiful little doves, but did not know where to look for their nests, and only discovered this one by accident. It was situated between the horizontal forks of a limb about twenty feet from the ground, and consisted merely of a slight platform of grasses laid on the forks. It contained two small white eggs pointed at either end and marked inside with the lateral transparent lines peculiar to the eggs of the dove family when fresh. This situation of the nest was contrary to my preconceived ideas

of it; the little dove, while nowhere common, is found throughout our southern borders. The short-legged pewee (*Contopus richardsonii*) does not seem to be rare throughout this southern country, but I only succeeded in finding one nest. It was saddled to a horizontal limb after the fashion of our wood pewee, and was composed of small twigs and grasses fastened together and to the limb with saliva, and was lined with finer grasses. The three eggs, well advanced in incubation, were of the size and shape of those of the wood pewee, and were of the same body color, but marked with some very large and some small reddish-brown blotches, chiefly around the middle of the egg. I also found a set of four eggs of another fly-catcher, the ash-throated fly-catcher (*Myiarchus mexicanus*), the same day that I found the nest of the short-legged pewee. It was in a hole in a willow tree, and consisted merely of a bunch of matted hair and wool. The eggs are so like those of the great crested fly-catcher as to be almost indistinguishable. On another hunt shortly before leaving Tucson, I found nests and eggs of two more thrushes peculiar to this border fauna, viz: the crissal thrush (*Harporhynchus crissalis*) and the curve-billed thrush (*H. curvirostris*). The former nest was situated in a low oak tree, a few feet from the ground, and was not large for the size of the bird. It was composed of coarse and small sticks, and was lined with fibers; the eggs, two in number and well incubated, were of the size and color of the robin's egg. The curve-billed thrush had nested in a tall cactus, and its nest was much larger and deeper than that of the *H. crissalis*; the cavity, in fact, was nearly four inches deep. The three eggs, about the size of the former, were of a light-green color, marked all over with fine red spots. Several other nests found the same day, but empty, were likewise in the cactus. A set of two eggs of the Western night-hawk (*Chordeiles henryi*), found somewhat later, did not differ materially from the eggs of the *C. popetue*, and were laid on the bare ground beneath a bush. The birds are everywhere abundant.

I will now describe the nest and eggs of another minute species of the titmouse family, the verdin or yellow-headed titmouse (*Paroides flaviceps*). I first observed the nests of these little birds on the Colorado desert, where, out of many I examined, only one was occupied, and that by fully fledged young. At Tucson, however, I succeeded in finding two nests of the second laying, with

respectively three and four eggs in. Their nests are wonderful pieces of bird architecture, being often half the size of a man's head, and the builder scarce larger than a humming bird! They were each built at the end of a horizontal limb, and firmly woven around it; composed of thorny twigs well interwoven with grasses, vegetable fibers and mosses, and the interior compactly lined with down and feathers, not only on the bottom but all around the inner circumference of the nest. The entrances to these unique structures were at first invisible to me, so small and well concealed were they; placed at the top or on one side, they were either immediately under the supporting limb or the fabric of the nest above the hole was pulled down so as to conceal its presence. The little birds are very shy, and seldom show themselves except when they have young. The eggs in both nests were well incubated and I am convinced were all the birds were going to lay in that, their second nest. Five constitutes the full number in the first set, as proved by the five young birds I found on the desert. The nests, although generally situated within a few feet of the ground, were sometimes placed as high as twenty feet, and some, too, were placed between the forks of a cactus. The eggs are of a light-green color, varying in intensity in different specimens, and were marked with numerous fleckings of a golden-brown, more numerous around the larger end; they were of a scant half inch in length, and rather pointed.

Another bird peculiar to this fauna is the chapparal cock or road-runner (*Geococcyx californianus*). This bird is wide-spread throughout the southern borders of our country, and its eggs are not rare in collections; but as to their number and the situation of the nest, there are contrary assertions. I have heard it said that two constituted the full set, and that one was laid some time before the other, after the occasional manner of the cuckoo; also that the nest was laid on the ground in the midst of a clump of cactus. I have seen a good many nests and heard from collectors in the localities of many more, and while occasionally placed in the cactus and rarely on the ground, the majority of the nests were in thick bushes; and in one case, as witnessed by myself, the nest was built on a thick horizontal mesquite limb, fully twelve feet from the ground. The nest, too, instead of being rude and imperfect, was rather neatly built of coarse sticks, and with the considerable cavity lined with grasses. The eggs in this nest

—pure white and about the size of a pigeon's egg—were five in number; two were considerably advanced in incubation, one was pipped and two were infertile. In another nest, found by a friend and authentic, were seven eggs, none so far incubated as to render blowing them difficult, and some infertile. I scarce know what inference to draw from these instances of a large number of eggs, but do not think the bird would raise so large a brood. Also the presence of infertile eggs in these nests where there were large numbers of eggs, seems to contradict the idea that they raise such a large brood. But why did they lay so many eggs? Perhaps some observer has explained, but I have never seen the explanation.

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EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

— Nomenclature is an essential part of language. Owing to the sense limitations under which we exist, objects must have names. So also must general concepts derived from objects have names. The one essential of naming is, of course, that distinct things shall have distinct names; and the second essential is, that each object or concept shall have but one name. These necessities become more and more urgent, as the number of known objects becomes greater. In order that each object and concept shall have but one name, cultivators of the natural sciences have determined to use that name which was first proposed with such a definition as shall enable them to ascertain the application intended by its author. All subsequent names are thus necessarily rejected as waste, to be forgotten as soon as possible. Moreover, names created for objects or concepts which are not defined, are rejected, as not being really proposed; for a name which is not applied to a stated object or concept, is quite as little nomenclature as an object or concept without a name. A name is, in fact, a short substitute for a definition, and where no definition¹ exists, there can be no name. Thus the rule of priority has become the *modus operandi* of nomenclature, and its only possible law.

Besides this practical necessity, an ethical element enters the question. The good opinion of the world is as much property as money and real estate. In fact, *it is* money and real estate.

¹ It is evident that definitions must often, in the early stages of a subject, be imperfect. But even a bad definition conforms to the necessary rule.